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## THE CRREL COLD REGIONS TACTICAL SHELTER

by

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Shelter is one of man's most basic needs for survival in cold regions. The modern Army is turning from tents to hard-wall shelters to establish bases of operation for men and sophisticated equipment anywhere they are needed. The north punishes men and equipment with sustained periods of extreme cold, high winds, ice and snow. Routine tasks become arduous. Current military shelters pose some significant problems for a soldier in the extreme cold. Tests indicate that the time required to set up a shelter is about twice that desired.<sup>1</sup> Furthermore, the soldier must take off his arctic mittens to perform more than half the required connections. The more he needs to get in the shelter and out of the cold, the longer it takes him.

A fuel-fired heater module that sits out in the cold is connected to the shelter via flexible ductwork. Meanwhile, somewhere a generator is running to supply electrical power. Both the heater and generator dump their waste heat directly into the air, thereby consuming fuel rather inefficiently.

The Army's requirements for a family of standard rigid wall shelters<sup>2</sup> state that "kits or special models" may be required for cold and extreme cold regions. Which makes more sense: trying to overcome the cold with special kits and bigger heaters or designing shelters for the cold? The first alternative exists, let's see what the second offers:

The authors set out to design an air transportable shelter that would meet economically the Army's requirements under the rigors of extremely cold weather. The shelters group at the U.S. Army Natick Development Center (NDC) contributed valuable advice to the project. NDC is the lead laboratory in the tactical shelters program organized by JOCOTAS, the Joint Committee on Tactical Shelters.

The design had to serve in two basic modes: shipping and deployed for use. In the shipping mode, the 8 ft x 8 ft x 20 ft CRREL shelter serves as its own air/sea/land shipping container, compatible with international ISO shipping container standards and USAF 463L cargo handling systems. When this box arrives near its site on an aircraft or truck it is fitted with its own legs mounted with wheels or skis so

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<sup>1</sup>Malone, Capt Alan J.; Engineer Design Test of Air Transportable shelters; U.S. Army Arctic Test Center, APO Seattle 98733; 10 June 1974.

<sup>2</sup>TRADOC: Required Operational Capability (ROC) for a family of Standard Rigid Wall Shelters System, 31 July 1974.

it can be towed nearby without employing special mobilizers (Fig. 1). The legs are designed to cushion the impact of landing when the shelter is delivered by helicopter.

On site, a crew of two or more individuals adjusts the four legs to level the container, and flops down the four-foot wide 19 ft long hinged porch and installs an exhaust pipe. After these three simple operations, the on-board generator can be switched on for power and heat, food can be prepared and the bunk room occupied. The 128 square foot core module contains the essentials for survival. Two more simple steps expand the shelter to an area of 265 square feet: First, the roof and three walls deploy sideways as a rigid structural unit (Fig. 2). Then, a floor swings down inside to form 137 square feet of multi-purpose work area. The resulting hard-wall work/living area is shown in plan in Figure 3.

At this point the shelter is quite habitable but admittedly small. This limited space is too valuable to share with bulky supplies and other low-intensity uses. Rather than relegate these to a snow bank outside, they can occupy the 15 ft x 20 ft shelter roof once the tentage is deployed as shown in Figure 4.

This gabled structure of nylon fabric, poles and cables was designed in conjunction with the tentage branch at the U.S. Army Natick Development Center. It protects the building and creates an "arctic entrance" and tempered work space on the porch and ample storage/bivouac space on the roof. An overflow crowd of soldiers would welcome this alternative to tenting on snow.

An 8-KW liquid-cooled gasoline powered generator is located in one corner of the module's utility package along with a snow melter and storage tanks for hot and cold water. Waste heat from the generator engine is capable of comfortably heating the expanded module in severe winter conditions, melting snow for water and warming water for washing. Each gallon of fuel is used most efficiently.

The shelter has undergone shake-down testing in the New England winter of 1977. Preliminary tests of the shelter's deployment and mobilization are encouraging. A USAF C-130 transport aircraft was used to demonstrate the ease of loading and unloading the shelter without supportive equipment (Fig. 1). Extensive tests are planned for next winter at Ft. Greely, Alaska, where the temperature sometimes drops to -60°F for sustained periods.

It is expected that production costs per square foot will be below those of current military shelters. This is because the shelter consists of shop-made foam-core plywood panels, fitted into a subassembly of common aluminum and steel structural members. This "low technology"



Figure 1. The shelter in shipping configuration being loaded onto a USAF C-130. Legs mounted with wheels or skis permit mobility to and from nearby sites. These legs are removed for transport.

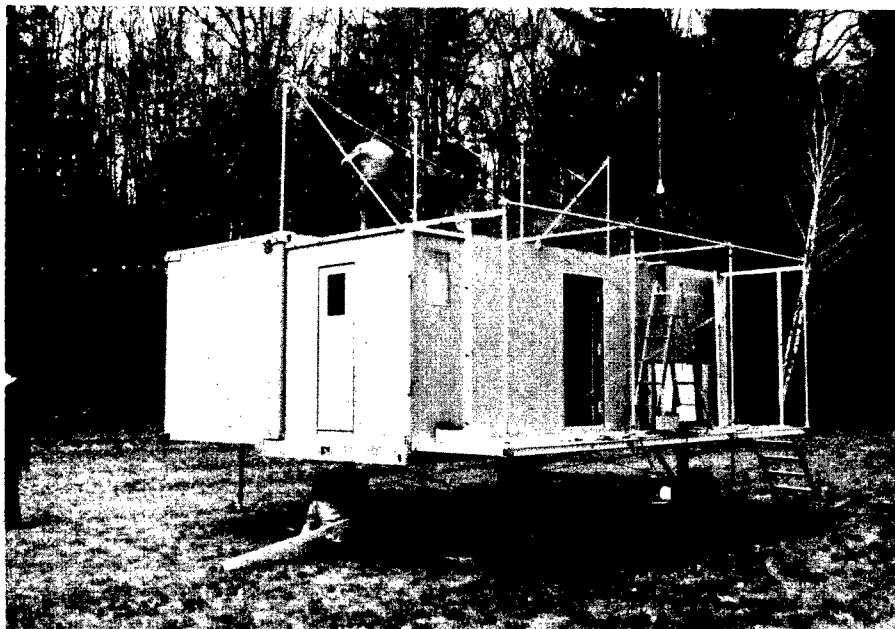


Figure 2. The deployed shelter. Roof, sidewall, and end walls roll back to the left as a rigid structural unit. The porch hinges down revealing the front door and engine compartment access (behind the step ladder). A frame is erected for tentage.

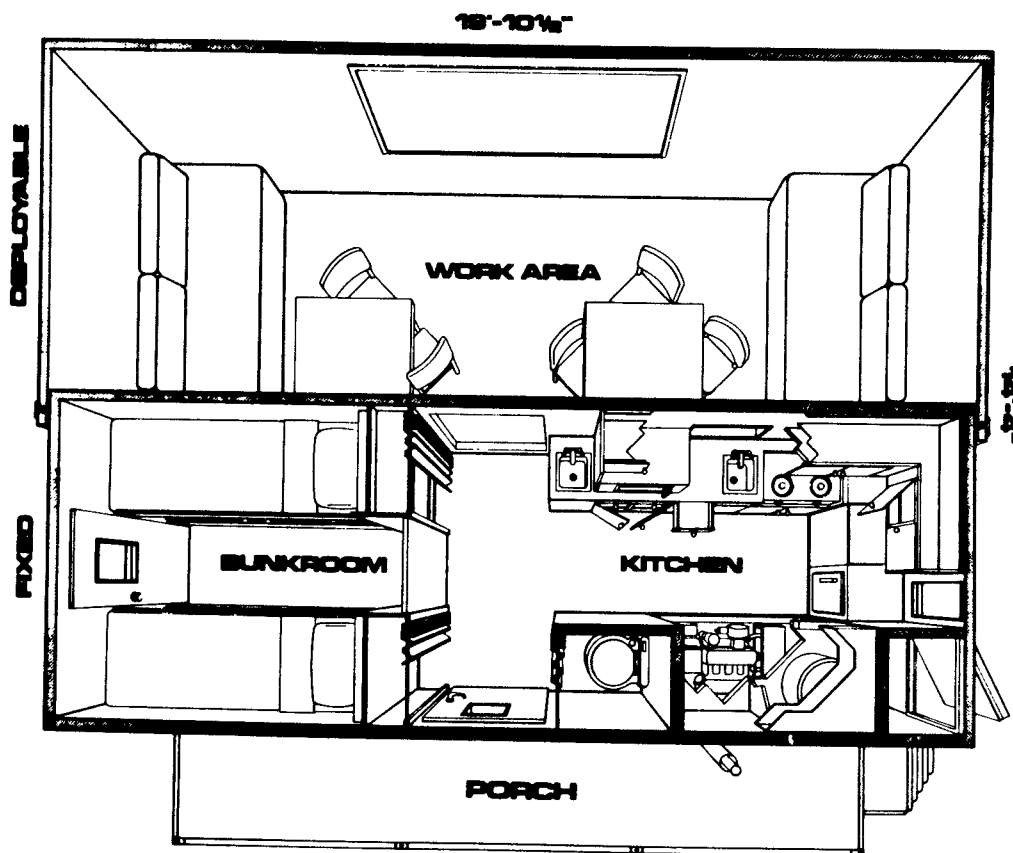


Figure 3. Interior layout of the deployed unit.



Figure 4. Tentage over the shelter provides an "Arctic entrance" and ample storage space.

construction is an alternative to the expensive aerospace technology typical of current shelters which employ honeycomb panels adhered under clean room conditions and interconnected with complicated aluminum extrusions. Although this simplified approach has added a little extra weight to the shelter, it has eliminated the need for numerous sophisticated, vulnerable field connections. A few large bolts that can be handled by individuals wearing arctic mittens hold the parts together.

This building system is expected to have much to offer:

- \* A capability to withstand the rigors of the arctic weather and out-perform current military shelters in the cold.
- \* Less energy consumption than other military shelters.
- \* Compatibility with both civilian and military transportation systems for air, sea and land.
- \* Mobility and independence from logistical support.
- \* Simplicity of manufacture; small contracting firms can furnish these shelters as the need arises, eliminating a large inventory prone to deteriorate in storage.
- \* Lower building cost per square foot than current shelters; its relatively simple construction opens up opportunities for small businesses to compete in the bidding.

The shelter was designed to meet the Army's need for tactical shelters in cold regions. The many features that make it suited for extreme cold are adaptable to extreme heat and conditions in-between. Future applications may be for remote facilities at disaster scenes, research camps or other temporary sites. The CRREL shelter should be a significant addition to the Army's family of shelters.